

EVALUATION OF THE VASCULAR FLORA OF MADEIRA'S EXTREME EAST

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With 3 figures, 1 table and 1 map

ABSTRACT. A preliminary survey of the occurring natural² and semi-natural³ vegetation at Ponta de São Lourenço was made with a special reference to the Ilhéu dos Desembarcadouros.

The floristic interest of this peninsula is put in evidence by the percentage of macaronesian (8,28%) and madeiran (14,01%) endemic taxa found, some of which are exclusive to this part of Madeira island. The importance of these values is enhanced by new records of endemic taxa at the study sites and for the first time *Lycium intricatum* Boiss is referred to Madeira archipelago.

A list of the vascular plants is presented. A total of 157 taxa are listed, 9 pteridophytes and 148 angiosperms. Distribution patterns of the most frequent species at the Ilhéu dos Desembarcadouros were observed.

Due to the high number of endemics on Ponta de São Lourenço and Ilhéu dos Desembarcadouros these are considered priority sites for *in situ* preservation and implementation of conservation polities.

INTRODUCTION

The Madeira archipelago is an important floristic and phytogeographical region harbouring a high number of endemic and relict taxa which have survived or diversified because of the wide diversity of habitats (TAVARES, 1965).

The occurrence of specific plant communities in the Madeira island is strongly correlated to the altitudinal gradient of the climatic conditions and in a certain extent with the geomorphology of the island (SOGREN, 1972).

The most xerophytic vegetation is mostly found at the Madeiran extreme east. Its high dryness is in part due to the low annual rainfall (less than 500mm), intense oceanic influence of the north-eastern winds, the soil characteristics and the occasional but intense

² *Natural* is used here in the sense of vegetation composed mainly by indigenous taxa.

³ *Semi-natural* is used in the sense of vegetation with a high proportion of introduced taxa.

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effects of the hot and dry eastern winds from Sahara region.

This part of the island, with a very low altitude, a maximum of 180 m above sea level and an average of 100 m, comprises a peninsula, Ponta de São Lourenço (PSL), with an approximate area of 405 ha, and three small islands, Ilhéu do Agostinho, Ilhéu de Fora and Ilhéu dos Desembarcadouros (ID) which is the largest one with an area of about 50 ha.

The origin of the land is volcanic and is characterized by the presence of both basaltic and fossiliferous calcareous sediments (CARVALHO & BRANDÃO, 1991)

The shallower slopes are mainly exposed to the south being most sheltered against the predominant NE winds.

A long time ago it seems that this extreme was covered by an abundant vegetation. Nowadays, as a vestige of that flora several structures similar to roots can be found buried in the sandy soil of Piedade (SILVA & MENESES, 1984).

MATERIAL AND METHODS

Studied sites and field analysis

The study sites comprises the PSL and ID.

Field surveys were undertaken throughout the study sites from the beginning of 1990 until the Summer of 1994. Collections and records were made during different periods of time, mainly from the Spring to late Summer.

Only the natural occurring vegetation containing the introduced plants which have naturalized were taken into account.

The collections are kept in MADJ.

The nomenclature largely follows HANSEN & SUNDING (1993) and sometimes VIEIRA (1992).

Herbarium material

Additional herbarium specimens held at the MADS and MADJ, and not collected by the authors of this paper, were studied and added to the list of taxa (Table 1)

RESULTS AND DISCUSSION

The vegetation cover of the study sites is mainly formed by a herb layer and a sparse distribution of some shrubs such as: *Echium nervosum*, *Argyranthemum pinnatifidum ssp. succulentum*, and *Suaeda vera*. The rocks fissures on shaded cliffs are the preferred sites for the establishment of the pteridophytes frequently associated with mosses and liverworts.

The most frequent species on ID is *Suaeda vera*, occurring along all the surface of the island mixed with other species. And due to the existence of particularly large populations

of some species it is possible to identify well defined plant distribution patterns (Map. 1).

At PSL one of several taxa may be dominant, particularly *Suaeda vera*, *Hyparrhenia hirta*, *Plantago coronopus*, *Andryala glandulosa* ssp. *glandulosa*, *Galactites tomentosa*, *Cynara cardunculus* var. *ferocissima*, *Lotus glaucus* var. *glaucus*, *Mesembryanthemum crystallinum* and *M. nodiflorum*.

The difference in the size of some plant populations at the two studied sites is much evident particularly for some species. At ID the populations of *Crepis divaricata*, var. *robusta*, *Chenolioides tomentosa* and *Echium nervosum* are much bigger than at PSL. But the other way round happens for the populations of *Argyranthemum pinnatifidum* ssp. *succulentum*, *Helychrysum devium* and *Tolpis succulenta*.

Several isolated individuals of several shrubby species were observed. On the south slope at the eastern part of PSL we can find a plant of *Sideroxylon marmulano*, several plants of *Euphorbia piscatoria* associated with several plants of *Siderites candicans* var. *crassifolia*. On cliffs impracticable to reach and so distant that it was not possible to confirm their identification, isolated individuals were observed of *Teline maderensis* on the north slope of PSL and *Maytenus umbellata* on the south coast.

A relevant note goes to several taxa such as: *Sinapidendron frutescens*, *Sideroxylon marmulano*, *Euphorbia piscatoria*, *Phyllis nobla*, *Lotus argyrodus*, *Aeonium glandulosum*, *Aeonium glutinosum*, *Aychryson villosum* and *Sedum nudum* ssp. *nudum*. All of these have their occurrence on the study areas reported for the first time. Also for the first time *Lycium intricatum* is referred to Madeira archipelago, occurring at the south coast of PSL.

The Madeiran extreme east vegetation is characterized by the occurrence of some species which have not been reported elsewhere in the island: *Asphodelus fistulosus*, *Lycium intricatum*, *Launea arborescens*, *Frankenia laevis*, *Beta patula* and *Phalaris maderensis*; being the last two Madeiran endemics restricted to ID.

The taxa *Genista tenera* and *Myosotis ramosissima* reported and existing as herbarium specimens at MADJ, were not found in this survey.

The vascular flora found at the two sites includes 35 endemics, 22 exclusive to Madeira archipelago and the other 13 are macaronesian endemics.

PSL is undoubtedly the site with the higher number of endemics, 31, against 19 found at ID. However, it is important to mention the smaller size of ID and the fact that 18 species occurring at this small island, including 5 endemics, were not found at PSL.

The percentage of endemic plants calculated on the total number of taxa reported for each site is very similar, but slightly higher at ID with 26.76 % comparing to 21.99 % at PSL.

The most diverse family of vascular plants in the study area are the Asteraceae with 27 taxa, including 11 endemics, the Fabaceae with 23 taxa, including 4 endemics and the Poaceae with 16 taxa, including 1 endemic (Fig. 3).

CONCLUSIONS

The phytossociological studies made in the past by SOGREN (1972) and by HAMPSHIRE (1984) on the Ponta de São Lourenço showed the association *Bisserulae-Scorpiuretum*, named for the presence of two species of Fabaceae, *Bisserulae pelecinus* and *Scorpiurus vermiculata*. This association expresses the floristic composition of the most disturbed areas of this extreme and thus give us very little information about its natural indigenous vegetation.

The present vegetation found on PSL and ID is a result of a continuous man's influence since the island colonisation. The land was used in the past with agriculture purposes and also for grazing. The seeds of introduced species were disseminated by man, animals and wind into these areas limiting at a certain degree the development of the indigenous flora. The presence of rabbits and seagulls with their excrements, mainly on ID, seems to prevent a more abundant plant cover. All these events induce quantitative and qualitative disturbances on the vegetation of the study sites.

The reported occurrence of several shrubby species on PSL and ID, the existence of the appropriate climatic conditions and soil type possibly indicates that the former indigenous vegetation would include a larger proportion of some of these shrubs and thus the existence in the past of a higher stratum appears to be very plausible.

The natural indigenous vegetation is nowadays poorly represented and the existent small areas of vegetation largely composed by endemic plants are restricted to inaccessible places or areas that were in the past of very little use to agriculture.

On the other hand, the high number of endemic taxa reported here enable us to consider PSL and ID as priority sites for the preservation *in situ* of several endemic species. The fact that Ponta de São Lourenço is already a Special Reserve and the Ilhéu dos Desembarcadouros an Integral Natural Reserve of Madeira's Natural Park (NEVES & VALENTE, 1992) makes easier the implementation of conservation polities.

Future studies on these sites are needed in order to get a better understanding and knowledge of the native flora and vegetation of this peculiar coastal region.

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TABLE 1 - The nomenclature largely follows HANSEN & SUNDING, (1993) and sometimes VIEIRA, (1992).

FAMILY	TAXON	ENDEMISM	LOCALITY
Adiantaceae	<i>Adiantum capillus-veneris</i> L.		PSL
Aizoaceae	<i>Aizoon canariense</i> L.		PSL ID
	<i>Mesembryanthemum crystallinum</i> L.		PSL ID
	<i>Mesembryanthemum nodiflorum</i> L.		PSL ID
Amarantaceae	<i>Achyranthes aspera</i> L.		PSL
Apiaceae	<i>Ammi majus</i> L.		PSL
	<i>Apium graveolens</i> L.		PSL
	<i>Crithmum maritimum</i> L.		PSL
Aspleniaceae	<i>Asplenium bilotii</i> F.W.Schultz		PSL
	<i>Asplenium marinum</i> L.		PSL ID
Asteraceae	<i>Andryala glandulosa</i> Lam. ssp. <i>glandulosa</i>		PSL ID
	<i>Anthemis cotula</i> L.		ID
	<i>Argyranthemum pinnatifidum</i> (L.fil.)Lowe ssp. <i>succulentum</i> (Lowe)Humphr.	M	PSL ID
	<i>Bidens pilosa</i> L.		PSL
	<i>Calendula arvensis</i> L.		PSL ID
	<i>Calendula maderensis</i> DC.	M	PSL ID
	<i>Carlina salicifolia</i> (L.fil.) Cav. var. <i>inermis</i> Lowe	M Can	PSL
	<i>Centaurea melitensis</i> L.		PSL ID
	<i>Chartamus lanatus</i> L.		PSL
	<i>Cichorium endivia</i> L.		PSL
	<i>Conyza canadensis</i> (L.) cronq.		PSL
	<i>Crepis divaricata</i> (Lowe)F.W.Schultz var. <i>robusta</i>	M	PSL ID
	<i>Cynara cardunculus</i> L. var. <i>ferocissima</i> Lowe	M Can	PSL ID
	<i>Galactites tomentosa</i> Moench.		PSL ID
	<i>Hedypnois cretica</i> (L.)Dum.-Cours		PSL
	<i>Helichrysum devium</i> Johns	M	PSL ID
	<i>Helichrysum monizii</i> Lowe	M	PSL ID
	<i>Helicrysum obconicum</i> DC.	M	PSL ID
	<i>Launea arborescens</i> (Batt.)Murb.		PSL
	<i>Leontodon taraxacoides</i> (Vill.) Mérat.		PSL ID
	<i>Phagnalon saxatile</i> (L.)Cass.		PSL
	<i>Scelymus maculatus</i> L.		PSL
	<i>Senecio incrassatus</i> Lowe	M Can	PSL ID
	<i>Sonchus oleraceus</i> L.		PSL ID
	<i>Sonchus ustulatus</i> Lowe ssp. <i>maderensis</i> Aldr.	M	PSL ID
	<i>Tanacetum parthenium</i> (L.) Sch. Bip.		ID
	<i>Tolpis succulenta</i> (Dryand.in Ait.) Lowe	M Az	PSL ID
Boraginaceae	<i>Echium nervosum</i> Dryand.	M	PSL ID
	<i>Echium plantagineum</i> L.		PSL ID
	<i>Myosotis ramosissima</i> Rochel		PSL
Brassicaceae	<i>Coronopus didymus</i> (L.)J.E.Sm.		PSL ID
	<i>Crambe fruticosa</i> L. fil	M	PSL ID
	<i>Eruca vesicaria</i> (L.)Cav. ssp. <i>sativa</i> (Mill.) Thell.		PSL ID
	<i>Erysimum bicolor</i> (Hornem.)DC.	M Can	PSL ID

FAMILY	TAXON	ENDEMISM	LOCALITY
	<i>Matthiola maderensis</i> Lowe	M	PSL ID
	<i>Nasturtium officinale</i> R.Br.		PSL
	<i>Rapistrum rugosum</i> (L.)All.s. l.		PSL ID
	<i>Sinapidendron frutescens</i> (Sol. in Ait.) Lowe ssp.succulentum (Lowe) Rustan	M	PSL
Campanulaceae	<i>Whalenbergia lobelioides</i> (L.fil)A. DC.	M Can CV	PSL
Caryophyllaceae	<i>Herniaria cinerea</i> DC.		ID
	<i>Petrorhagia nanteuillii</i> (Burn.)Ball et Heyw		PSL
	<i>Polycarpon tetraphyllum</i> (L.)L.		PSL ID
	<i>Silene gallica</i> L.		PSL ID
	<i>Silene vulgaris</i> (Moench.)Garcke ssp. maritima (With.) A. et D. Love		PSL ID
	<i>Spergula arvensis</i> L.		ID
	<i>Spergularia bocconei</i> (Schelle) A. et Gr.		PSL
	<i>Spergularia fallax</i> Lowe		ID
Chenopodiaceae	<i>Atriplex halimus</i> L.		PSL
	<i>Beta patula</i> Ait.	M	ID
	<i>Beta vulgaris</i> L.		PSL ID
	<i>Chenoleoides tomentosa</i> (Lowe)Botsch		PSL ID
	<i>Chenopodium murale</i> L.		PSL ID
	<i>Patellifolia procumbens</i> (Chr.Sm.exHornem.)S.F.-L.et W.	M Can CV	ID
	Spinaceae oleracea L.		PSL
	<i>Suaeda vera</i> Forssk.ex J.P.Gmel		PSL ID
Convolvulaceae	<i>Convolvulus althaeoides</i> L.		PSL ID
	<i>Cuscuta approximata</i> Bab		ID
Crassulaceae	<i>Aeonium glandulosum</i> (Ait.) Webb. et Berth.	M	PSL
	<i>Aeonium glutinosum</i> (Ait.) Webb. et Berth.	M	PSL
	<i>Aichrysum villosum</i> (Ait.) Webb et Berth	M AZ	PSL
	<i>Carpobrotus edulis</i> (L.)L.Bolus		PSL
	<i>Sedun nudum</i> Ait. ssp. nudum	M	PSL
Davalliaceae	<i>Davallia canariensis</i> (L.) J.E.Sm	M Az Can CV	PSL
Euphorbiaceae	<i>Euphorbia helioscopia</i> L.		PSL
	<i>Euphorbia peplis</i> L.		PSL
	<i>Euphorbia piscatoria</i> Ait.	M	PSL
	<i>Euphorbia terracina</i> L.		PSL
	<i>Mercurialis annua</i> L.		PSL ID
Fabaceae	<i>Aspalthium bituminosum</i> (L.) Fourr.		PSL
	<i>Astragalus sofandri</i> Lowe		PSL ID
	<i>Biserrula pelecinus</i> L.		PSL
	<i>Genista tenera</i> (Jaq. ex Murr.) O. Kuntze	M	PSL
	<i>Lotus angustissimus</i> L.		PSL
	<i>Lotus argyrodes</i> Murr.	M	PSL
	<i>Lotus glaucus</i> Ait. var. glaucus	M Can	PSL ID
	<i>Lotus afim macranthus</i> Lowe	M	ID
	<i>Medicago polymorpha</i> L.		PSL ID
	<i>Melilotus sulcata</i> Desf.		PSL ID
	<i>Ononis dentata</i> Sol. ex Lowe		ID
	<i>Ononis diffusa</i> Ten.		PSL
	<i>Ononis mitissima</i> L.		PSL
	<i>Ononis reclinata</i> L.		ID

FAMILY	TAXON	ENDEMISM	LOCALITY
	<i>Ornithopus pinnatus</i> (Mill.) Druce		PSL
	<i>Scorpiurus muricatus</i> L.		PSL ID
	<i>Scorpiurus vermiculatus</i> L.		PSL
	<i>Trifolium angustifolium</i> L.		PSL
	<i>Trifolium campestre</i> Schreb.		PSL
	<i>Trifolium lappaceum</i> L.		PSL
	<i>Trifolium resupinatum</i> L.		PSL
	<i>Trifolium scabrum</i> L.		PSL ID
	<i>Vicia tenuissima</i> (Bieb.) Schinz. & Thell		PSL ID
Frankeniaceae	<i>Frankenia laevis</i> L.		ID
Fumariaceae	<i>Fumaria muralis</i> Sond.ex Koch		PSL
Geraniaceae	<i>Erodium chium</i> (L.) Willd. ssp. <i>chium</i>		PSL ID
Gymnogrammeae	<i>Anogramma leptophylla</i> (L.) Link		PSL
Juncaceae	<i>Juncus acutus</i> L.		PSL
Lamiaceae	<i>Marrubium vulgare</i> L.		PSL
	<i>Micromeria varia</i> Benth ssp. <i>thymoides</i> (Sol ex Lowe) Pérez var. <i>thymoides</i>	M	PSL
	<i>Origanum vulgare</i> L.		PSL
	<i>Prunella vulgaris</i> L.		PSL
	<i>Siderites candicans</i> Ait. var. <i>crassifolia</i> Lowe	M	PSL
	<i>Stachys ocymastrum</i> (L.) Briq.		PSL
Liliaceae	<i>Asphodelus fistulosus</i> L.		PSL ID
Linaceae	<i>Linum strictum</i> L.		PSL ID
Malvaceae	<i>Malva parviflora</i> L. var. <i>parviflora</i>		PSL
Onagraceae	<i>Epilobium angustifolium</i> L. Scop.		PSL
Orobanchaceae	<i>Orobanche minor</i> J.E. Sm.		PSL
Papaveraceae	<i>Papaver somniferum</i> L. ssp. <i>somniferum</i>		ID
Plantaginaceae	<i>Plantago arborescens</i> Poir. ssp. <i>maderensis</i> (Dcne.) A. Hans et Kunk	M Can	PSL
	<i>Plantago coronopus</i> L.		PSL ID
	<i>Plantago lagopus</i> L.		PSL
	<i>Plantago lanceolata</i> L.		PSL
Poaceae	<i>Avena barbata</i> Pott. ex Link.		PSL
	<i>Avena fatua</i> L. ssp. <i>meridionalis</i> Malcev		ID
	<i>Briza maxima</i> L.		PSL
	<i>Briza minor</i> L.		PSL
	<i>Bromus madritensis</i> L. ssp. <i>madritensis</i>		PSL
	<i>Cenchrus ciliaris</i> L.		PSL
	<i>Cynodum dactylon</i> (L.) Pers		PSL
	<i>Hordeum murinum</i> L.		PSL ID
	<i>Hyparrhœnia hirta</i> (L.) Stapf.		PSL
	<i>Lagurus ovatus</i> L.		PSL ID
	<i>Lolium rigidum</i> Gaud		PSL
	<i>Paspalum distichum</i> L.		PSL
	<i>Phalaris aquatica</i> L.		PSL
	<i>Phalaris maderensis</i> Mnzs	M	ID
	<i>Setaria pumila</i> (Poir.) Roem. et Schult		PSL
	<i>Trachenya distachia</i> (Hasselq. ex L.) Link		ID
Polygonaceae	<i>Polygonum maritimum</i> L.		PSL
	<i>Rumex bucephalophorus</i> L.		PSL ID

FAMILY	TAXON	ENDEMISM	LOCALITY
	<i>Rumex pulcher</i> L.		PSL
Polypodiaceae	<i>Polipodium macaronesticum</i> Bobrov.s.l.		PSL ID
Portulacaceae	<i>Portulaca oleracea</i> L.		PSL ID
Primulaceae	<i>Anagallis arvensis</i> L.		PSL ID
Pteridaceae	<i>Pteridium aquilinum</i> (L.)Kuhn		PSL
Resedaceae	<i>Reseda luteola</i>		PSL
Rubiaceae	<i>Phyllis nobla</i> L.	M Can	PSL
Rutaceae	<i>Ruta chalepensis</i>		PSL
Sapotaceae	<i>Sideroxylon marmulano</i> Banks ex Lowe	M Can Cv	PSL
Selaginellaceae	<i>Selaginella denticulata</i> (L.) Spring.		PSL
Solanaceae	<i>Hyoscyamus albus</i> L.		PSL
	<i>Lycium intricatum</i> Boiss		PSL
	<i>Solanum linnaeanum</i> Hepper et Jaeger		PSL
	<i>Solanum nigrum</i> L.		PSL ID
Tetragoniaceae	<i>Tetragonia tetragonioides</i> (Pall.) O. Kuntze		PSL
Thelypteridaceae	<i>Stenogramma pozoi</i> (Lag.) Iwatsuki		PSL
Urticaceae	<i>Parietaria judaica</i> L.		PSL

M- Madeiran endemism; **M Can-** Madeira Canary endemism; **M Az-** Madeira Azores endemism; **M Az Can-** Madeira Azores Canary endemism; **M Can CV-** Madeira Canary Cape Verde endemism; **M Az Can CV-** Madeira Azores Canary Cape Verde endemism.

Localities to which the specimens are notice **PSL-** Peninsula of the Ponta de São Lourenço; **ID-** Island of the Ilhéu dos Desembarcadouros.

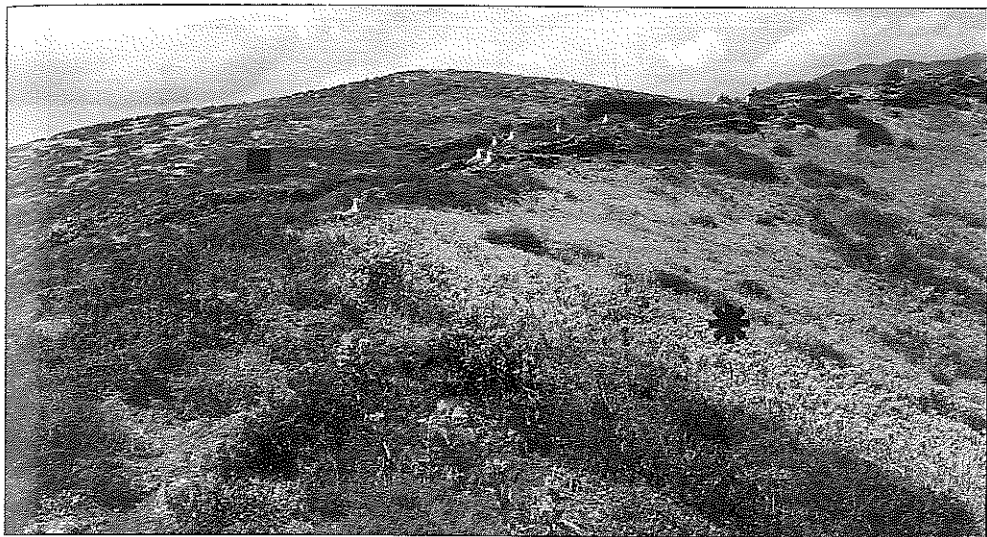


Figure 1 - Ilhéu dos Desembarcadouros.

Contrast between the north coast, covered by *Andryala glandulosa* (*), and the south coast with predominance of *Suaeda vera* (■).

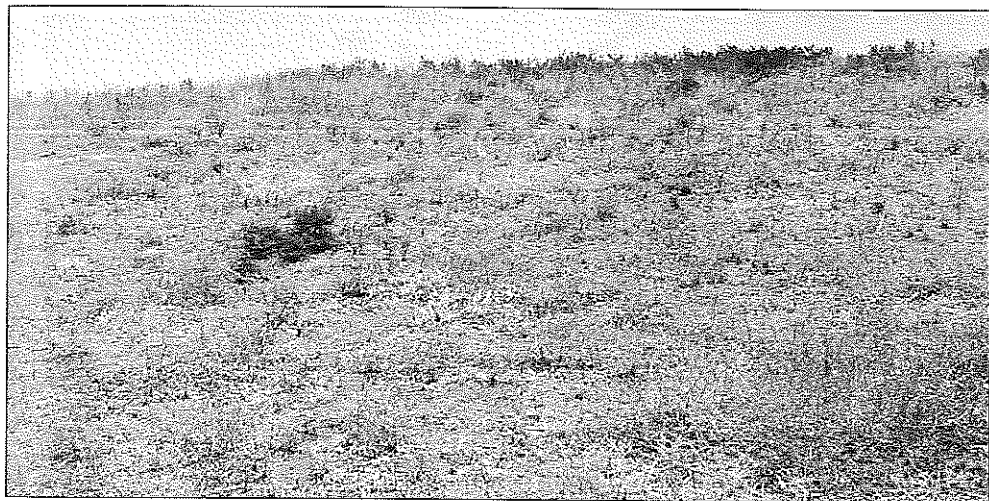


Figure 2 - Ilhéu dos Desembarcadouros.

High disturbance of the vegetation cover due to the influence of seagulls.

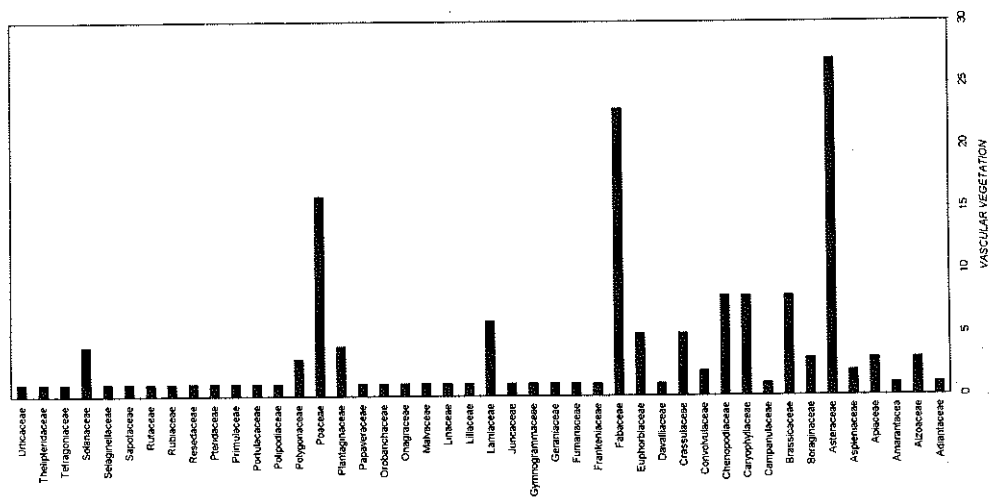


Figure 3 - Taxonomic pattern of the vascular vegetation, in terms of number of taxa.

Map 1 - Ilhéu dos Desembarcadouros.

Plants populations with a large soil cover and an area highly disturbed by the influence of seagulls.

